Modeling HIV Data with a Quadratic Function

In the United States, most children with HIV infections receive the infection from their mother when they are being delivered. In fact, 91% of the children in the United States have caught the HIV infection from their mothers. This transmission is known as mother-to-child or perinatal transmission. In the 1990s infections transmitted from mother to child in the United States were greatly reduced in part because of the use of drugs such as Zidovudine.

Examine and graph the data below to understand why in June 2002, President Bush signed a $500,000,000 White House initiative to combat perinatal HIV transmission in Africa and the Caribbean. It was called the International Mother to Child HIV Prevention Initiative. Through this initiative, Africa and the Caribbean received large amounts of aid. At that time, the situation in Uganda was particularly challenging. Of all the AIDS/HIV cases in Uganda, almost 47% are found in women aged 15 – 49.

1. In Uganda, why was it important to reduce perinatal transmission of AIDS/HIV?

2. Make a scatter plot of the data. Note that the independent variable, $t$, represents the number of years since 1985. Label and scale the axes.

Perinatal HIV Infections in the U.S. 1985-1998

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</thead>
<tbody>
<tr>
<td>Number of years since 1985, $t$</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>8</td>
<td>9</td>
<td>11</td>
<td>13</td>
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<tr>
<td>Number of cases</td>
<td>210</td>
<td>380</td>
<td>500</td>
<td>780</td>
<td>770</td>
<td>680</td>
<td>460</td>
<td>300</td>
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</tbody>
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Source: Centers for Disease Control and National Institute of Allergy and Infectious Diseases
3. The use of drugs such as Zidovudine was emphasized by this initiative. Based on your graph of the U.S. data, do you think this was a good idea? Explain.

4. Examine the data table. For linear and exponential data tables the dependent variable always increases or decreases (for the most part when the tables contained real world data). What is different about this data table?

5. When you graphed linear or exponential data, the graph was always increasing or always decreasing. What is happening with this graph?

6. Although there is not an ordered pair in the data that is a “highest” point on the graph, you can imagine one. What do you think are the coordinates of this highest point?

7. The point you have estimated is called the vertex. When did the United States start winning the war against perinatal transmission of HIV? __________. Explain how you made your decision.

8. How many cases of perinatal HIV transmission occurred just as the U.S. was able to turn the tide on the war against this disease?